Short Answer Type Questions

Q. 1. Find the number of terms in the A.P. 7, 10, 13, …. 31 **[DDE-2017]**

Sol. Given A.P. is 7, 10, 13, …. 31

Here, a = 7, $I = 30$ and $d = 3$ Using formula, $I = a + (n-1)d$

$\Rightarrow 31 - 7 = 3n - 3$

$\Rightarrow 24 + 3 = 3n$

$\Rightarrow n = 9$

Q. 2. In an A.P., 8, 11, 14,.. Find $s_n - s_n - 1$. **[DDE-2017]**

Sol. We know that, $s_n - s_n = a_{n,}$ Swhich is the n^{th} term of A.P.

Here, $a = 8, d = 3$

$\therefore \quad a_n = T_n = a + (n-1)d$

$= 8 + (n-1)3$

$= 3n + 5$

Q. 3. Find the sun of given terms: -

81 + 82 + 83 + …. + 89 + 90 **[DDE-2017]**

Sol. Given series 81 + 82 + 83 + …. + 89 + 90

$\therefore \quad T_n = I = a + (n-1)d$

$\therefore \quad 90 = 81 + (n-1).1$

(here, $a = 81$, $I = 90$ and $d = 1$)

$\Rightarrow n = 9$

Now,

$S_n = \frac{n}{2}[2a + (n-1)d]$

$= \frac{10}{2}[2 \times 81 + (10-1) \times 1]$

$= 5[162 + 9]$

$= 5 \times 171 = 855$

Q. 4. 251 + 252 + 253 + …. + 259 + 260 **[DDE-2017]**

Sol. Given series, 251 + 252 + 253 + …. + 259 + 260

We know that, $T_n = l = a + (n-1)d$

Here, $a = 250, d = 1$ and $I = 260$

$\therefore \quad 260 = 251 + (n-1).1$

$\Rightarrow n = 10$

Now,

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

$$= \frac{10}{2}[2 \times 251 + (10-1)1]$$

$$= 5[502 + 9]$$

$$= 5[511]$$

$$= 2555$$

Q. 5. Find the number of squares that can be formed on 8 x 8 chess board?
[DDE-2017]

Sol. The number of squares in a $n \times n$ chess board will be $\sum n^2; n$ varying from 1 to n.

$$\text{Now,} \sum n^2 = 1^2 + 2^2 + 3^2 + \cdots n^2$$

$$= \frac{n(n+1)(2n+1)}{6} \qquad \ldots.(i)$$

Put $n = 8$ in eq (i), we get

$$\sum 8^2 = \frac{8 \times (8+1)(2 \times 8 \times 1)}{6} = \frac{8 \times 9 \times 17}{6} = 204$$

Q. 6. In a G.P., the 3^{rd} term is 24 and 6^{rd} term is 192. Find the 10^{th} term.
[DDE-2017]

Sol. Let the first term of G.P. be a and the common ratio be r.

Given, $T_3 = 24$

$\Rightarrow \quad ar^2 = 24 \ldots \ldots \ldots (i)$

And $\quad T_6 = 192$

$\Rightarrow \quad ar^5 = 192 \ldots \ldots \ldots (ii)$

Dividing eq. (i) by (ii), we get

$$\frac{ar^5}{ar^2} = \frac{192}{24}$$

$\Rightarrow \ r^3 = 8 \quad$ or $\quad r = 2$

Putting the value of r in eq. (i), we get $a(2)^2 = 24$

$\Rightarrow \ a = 6$

$\therefore \ T_{10} = ar^9$

$= 6(2)^9$

$= 3072$

Q. 7. If a, b, c are in G.P, then show that $a^2 + b^2, ab + bc, b^2 + c^2$ are also im G.P. **[DDE-2017]**

Sol. Given that, a, b, c are in G.P

$\Rightarrow b^2 = ac$

$\Rightarrow b^2 - ac = 0$

$\Rightarrow (b^2 - ac)^2 = 0$

$\Rightarrow b^4 + a^2c^2 - 2b^2ac = 0$

$\Rightarrow a^2b^2 + b^2c^2 + 2b^2ac = a^2b^2 + b^2c^2 + a^2c^2 + b^4$

(Adding $a^2b^2 + b^2c^2$ both sides)

$\Rightarrow (ab + bc)^2 = (a^2+b^2)(b^2+c^2)$

$\Rightarrow \ a^2 + b^2, ab + bc, b^2 + c^2$ are in G.P.

Hence Proved

Q. 8. Write the n^{th} term of the series $\frac{3}{7.11^2} + \frac{5}{8.12^2} + \frac{7}{9.13^2} + \cdots$ **[DDE-2017]**

Sol. N term of 3,5,7,… is $\quad 2n + 1$

n^{th} term of 7,8,9,… is $\quad 6 + n$

n^{th} term of $11^2, 12^2, 13^2, \ldots$ is $\quad (10 + n)^2$

$\therefore \ n^{th}$ term of the given series = $\dfrac{2n+1}{(6+n)(10+n)^2}$